GZA
GeoEnvironmental, Inc.

Engineers and
Scientists

December 6, 2013
File No. 01.0171716.00

Mr. Jonathan McCredie
Fennick-McCredie Architecture, Ltd.
65 Franklin Street
Boston, Massachusetts 02210

Re: Preliminary Geotechnical Engineering Report
Plymouth Transportation & Visitors Center
Plymouth, Massachusetts

249 Vanderbilt Ave.
Norwood
Massachusetts
02062
781-278-3700
FAX 781-278-5701
http://www.gza.com

Dear Mr. McCredie:

In accordance with our agreement dated July 17, 2013, GZA GeoEnvironmental, Inc. (GZA) is pleased to submit this report to Fennick McCredie Architecture, Ltd. (Client), which summarizes the results of our preliminary geotechnical engineering evaluation for the proposed Plymouth Transportation & Visitors Center (PT&VC) located in the Memorial Hall parking lot in Plymouth, Massachusetts. This report is intended to address GZA's Scope of Work under Phase 1, Task 11 of the proposed development. The objective of our work was to evaluate subsurface conditions in the vicinity of the proposed structure and to provide geotechnical design and construction recommendations relative to the proposed development.

Due to ongoing design development, the recommendations contained in this report should be considered preliminary and should be re-evaluated by GZA for final design. This report is subject to the Limitations set forth in Appendix A and the Terms and Conditions of our agreement.

Elevations indicated in this report are in feet and are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).

BACKGROUND

Our understanding of site conditions and the proposed development is based on the following:

- A report entitled "Plymouth Transportation Center Site Selection Study" dated August 2012, prepared by McMahon Transportation Engineers & Planners,
- A Phase I Preliminary Site Assessment Relative to Oil and Hazardous Materials prepared by CDW Consultants, Inc., dated June 2012,
- A PDF plan entitled "Topographic Plan, Municipal Parking Lot, Memorial Drive, Plymouth, Massachusetts" prepared by Nitsch Engineering dated October 25, 2011,
- A PDF plan entitled "Level 1 Plan" dated August 14, 2012, unknown preparer,
- A PDF plan entitled "Section, Parking Count, and Elevation/Material" dated August 14, 2012, unknown preparer,
- Available on-line aerial photographs and topographic maps, and;
- Our discussions with you and the design team.

Existing Conditions

The proposed PT&VC location (Site) is located in an existing paved parking lot (116 spaces) adjacent to Memorial Hall (corresponding to Site B in the McMahon Site Selection Study Report). The lot is currently operated by Park Plymouth. The Site is bordered by Water Street to the north, Memorial Drive to the east, Memorial Hall to the south, and existing buildings to the west. The Plymouth Visitor's Information Center, a small two-story building, is currently located at the northeast corner of the Site. Topography at the Site slopes at an approximately 3 percent grade towards Plymouth Harbor; from elevation 32 feet in the southern end of the Site to elevation 16 feet at the northern end.

Proposed Development

We understand that the proposed development currently consists of a four-level transportation facility with a bus terminal and visitor's center. The transportation facility is proposed to consist of a bus terminal and visitor's center on the ground floor, with three above-ground levels of parking. The footprint of the facility and the elevation of the lowest parking level have not yet been finalized.

Although the lowest parking level grade has not yet been set, we understand that cuts of up to eight feet may be required. We understand that the entrance to the facility will be from the north and therefore, little to no filling is expected along the north side of the site.

We understand that preliminary exterior and interior column loads are 1,240 and 2,200 kips, respectively.

We understand that an airwalk between the PT&VC and Memorial Hall may be included in future designs. If this feature becomes part of the design, GZA can provide geotechnical recommendations once the particulars for that structure have been defined.

SUBSURFACE EXPLORATIONS

Eleven borings (GZ-1 through GZ-11) were performed by New Hampshire Boring, Inc. (NHB) of Brockton, Massachusetts between July 18 and 23, 2013. The borings were performed within or near the footprint of the proposed building. Approximate boring locations are shown on Figure 1.

Each boring was performed with either a truck-mounted or all-terrain vehicle-mounted rig using cased rotary drive and wash drilling techniques. The borings were generally extended to a depth of approximately 26 feet, except for borings GZ-4 and GZ-5, which were extended to depths of 61 feet and 101 feet, respectively to provide additional data required for developing geotechnical seismic design parameters. Split-spoon samples were obtained and Standard Penetration Tests (SPTs) were performed in each boring. Existing asphalt paving and fill were removed to a depth of 0.5 to 1 foot prior to sampling. Continuous split-spoon samples were generally obtained through or within the upper portion of the fill stratum (to depths ranging from about 8.5 to 11 feet) and at approximately 5-foot intervals thereafter. Bedrock was not encountered in any of the borings. Each boring was backfilled with drill cuttings and the surface was restored using asphalt cold-patch upon completion.

A GZA representative observed the borings, obtained soil samples for geotechnical laboratory testing, visually classified the soil samples using the Modified Burmister Soil Classification System, and prepared boring logs, which are attached as Appendix B. GZA also field screened soil samples collected from eight of the borings for total volatile organic compounds (VOCs) using an Organic Vapor Meter equipped with a 10.6 eV photoionization lamp. Field screening results indicated low levels of VOCs in a few samples in the fill (less than 1.4 ppm). Field screening results are included on the boring logs.

GEOTECHNICAL LABORATORY ANALYSES

Laboratory grain size analyses were performed on 5 soil samples obtained from the borings to confirm field classifications, to help evaluate their potential for re-use as backfill on-site, and to aid with evaluation of potential liquefaction and estimates of hydraulic conductivity. Three samples of fine-grained soil were analyzed for Atterberg Limits (plasticity) to help confirm field classifications and to aid with estimates of hydraulic conductivity. Laboratory results are included in Appendix C.

SUBSURFACE CONDITIONS

Subsurface conditions generally consist of asphalt pavement over a predominantly granular fill underlain by alternating layers of natural silts/clays and sand. A general description of the subsurface conditions encountered in the explorations is summarized below. Refer to the boring logs in Appendix B for specific information at each boring.

Asphalt: A surficial asphalt layer was encountered at most of the borings (GZ-1, GZ-3, GZ-5 through GZ-8 and GZ-11) and where encountered, thicknesses ranged from about 2- to 6-inches.

Fill: Fill was encountered either at ground surface or below the asphalt layer to depths ranging from about 4 to 9 feet below existing grade (corresponding to bottom of the fill ranging from about elevations 9.5 to 25.2 feet) across the Site. In general, the fill over the approximately southern three-quarters of the site ranged from about 3.5 to 5 feet thick with thicker deposits ranging from about 7 to 9 feet thick (borings GZ-4 and GZ-11) at the northern end of the site.

The fill generally consisted of brown to gray, loose to medium dense (mostly medium dense with SPT N-values ranging from 9 to about 30 blows per foot), fine to medium or fine to coarse sand, typically between 10 to 20 percent but occasionally up to 50 percent gravel, typically 10 to 35 percent but occasionally up to 50 percent silt. At boring GZ-1, the fill consisted of predominantly medium dense silt with up to 50 percent fine to coarse sand.

It should be noted that the high SPT N-value (100 blows for 5 inches) encountered within the fill at GZ-10 at about 4.4 feet below ground surface may be due to the presence of an obstruction or cobble/boulder within the fill.

Alternating Natural Silts/Clays and Sands: Alternating layers of natural silts/clays and/or sands were encountered below the fill.

- ***Natural Silt/Clay Layer(s):*** Encountered in all borings except for GZ-8 interbedded within the sand. The layers ranged from about 3 to 17 or more feet in thickness, and were generally thicker at the northern end of the site. The natural silts/clays typically

consisted of stiff to hard (SPT N-values ranging from 9 to 78 blows per foot), gray to brown in color with occasional mottling, clayey silt to silty clay with up to 50 percent sand and occasional fine sand or silt seams (1/16- to ¼-inches-thick).

- ***Natural Sand Deposits:*** The sand deposits were generally medium dense to very dense (SPT N-values ranging from 10 to 96 blows per foot), except in borings GZ-6 and GZ-7, where the sand layer was medium-dense with SPT N-values generally ranging between 14 and 19 blows per foot. The sand deposits were brown to brown-red in color and ranged from fine to medium or fine to coarse sand with up to 35 percent silt, and up to 20 percent gravel. An approximately 1-foot-thick boulder was encountered within this stratum in boring GZ-5 from 87.5 to 88.5 feet deep. In the two deep borings (GZ-4 and GZ-5), this natural sand stratum was present below the silt/clay layer and was not fully penetrated.

Bedrock: Bedrock was not encountered within the depth of any of the borings. Based on the MassGIS Oliver website, bedrock in the area of the project site is expected to consist of granite and is more than 100 feet below existing ground surface. The overlying overburden soils are classified as glacial stratified deposits.

Groundwater

Groundwater measurements were obtained from each boring during drilling (except at GZ-9 where no measurements were taken). The groundwater level measurements likely represent unstabilized levels because drilling water was used to advance the boreholes. In general, unstabilized groundwater levels ranged from about 3 to 5.5 feet below existing ground surface, corresponding to about elevation 25 feet in the southern side of the site to elevation 14 feet in the northern portion of the site.

Groundwater was measured at a depth of approximately 4.5 feet (corresponding to approximately elevation 25 feet) in borehole GZ-5 after a stabilization time of about 64 hours. Groundwater was measured to be at a depth of approximately 4.7 feet (corresponding to approximately elevation 22.8 feet) in boring GZ-6 after a stabilization time of approximately 16 hours. Groundwater observations are summarized in Table 1.

Most of the borings did not have readings with stabilization times greater than 20 minutes and as noted above, these results likely do not represent stabilized readings. In addition, fluctuations in groundwater levels are expected to occur due to variations in season, rainfall, tide, site features and other factors different from those existing at the time of the explorations and measurements.

GEOTECHNICAL IMPLICATIONS OF SUBSURFACE CONDITIONS

The primary geotechnical issues for design and construction of foundations for the proposed development are:

- **Variable Fill.** Due to its variable density, thickness, compressibility, and intermittent areas of fill containing a significant portion of fines, the existing fill is considered unsuitable for support of the proposed PT&VC foundations.

- **Relatively Shallow Groundwater.** Groundwater was observed during drilling at depths ranging from 3 to 5.5 feet below existing grade. This relatively shallow depth to

groundwater should be considered in setting the ground level floor slab elevation of the PT&VC to limit the need for permanent groundwater control and need for a structural building slab to resist hydrostatic uplift pressure. Installation of groundwater observation wells during future design phases of the project should be considered for further evaluation of groundwater conditions at the site.

- **Possible Environmental Issues.** The McMahon Site Selection Study Report and the Phase I Environmental Site Assessment by CDW indicated certain environmental conditions that would warrant that a Phase II subsurface investigation, including installation of observation wells for groundwater sampling, be conducted. The nature of GZA's study was entirely focused on developing preliminary geotechnical conclusions and recommendations. While our subsurface explorations did not suggest any obvious signs of contamination, final design and site development will need to consider the findings of the Phase II investigation. It is important to understand the environmental conditions on Site as they may impact the cost of handling and disposal of excavated and excess soil from the site, as well as pumping and possible treatment of temporary and permanent groundwater to be discharged from the site.

- **Unknown Building Footprint and Unknown Base Slab Elevation.** Based on discussions with the design team, we understand that cuts up to about 8 feet may be required. Once the final footprint and base slab elevation are known, the need for permanent dewatering and temporary groundwater control will be better defined, as well as the need for temporary excavation support to retain site cuts and protect adjacent buildings.

GEOTECHNICAL RECOMMENDATIONS

The geotechnical design recommendations presented below are based on GZA's evaluation of the available subsurface data and development plans and discussions with the design team. These recommendations are based on the International Building Code (IBC) 2009 and the Massachusetts Amendments to the IBC (MSBC) 8th Edition. These recommendations should be considered preliminary and should be reviewed by GZA as the design evolves. These recommendations are subject to the limitations in Appendix A.

1. Foundations

As noted above, the existing fill is unsuitable for support of building foundations. The proposed structure may be supported on spread footings bearing on undisturbed natural soils or on Structural Fill placed in controlled, compacted lifts over undisturbed natural soils following removal of unsuitable soils. Structural Fill material may consist of imported Granular Fill, imported Crushed Stone, or imported Sand-Gravel Fill (refer to Table 2 for recommended gradations). Subgrade preparation recommendations are presented later in this report.

Provided that foundation subgrades are prepared as described herein, the recommended maximum net allowable design bearing pressure for spread or strip footings is 2 tons per square foot (tsf) on undisturbed natural silt/clay or natural sand deposits (or on compacted Structural Fill placed above undisturbed natural silt/clay or natural sand).

Footings should be designed in accordance with the 2009 IBC and MSBC. For frost protection, all exterior footings and interior footings in unheated areas should bear at least 4

feet below final exterior grades. Interior footings in heated areas should bear at least 1.5 feet below top of slab.

2. Building Slab

Slab-on-grade construction is recommended for the PT&VC on a base course and drainage layer consisting of a minimum 8-inch thick layer of ¾-inch Crushed Stone. Prior to construction of the building slab, existing fill should be removed from within the slab area to a minimum depth of two feet below bottom of slab base course, the exposed subgrade be proof-compacted, and Structural Fill be placed in controlled, compacted lifts up to slab base course elevation in accordance with the subgrade preparation/construction recommendations provided later in this report.

We recommend that the base slab-on-grade be designed to include additional crack control joints since some existing fill may remain in-place below the base slab.

Please note that the recommendation for a slab-on-grade assumes that the design ground floor elevation of the PT&VC is located above the design groundwater elevation or that permanent pumping of groundwater is provided. Otherwise, a structural slab will be required to resist hydrostatic uplift pressure.

3. Foundation Settlement

Assuming the recommendations provided in this report are adopted for design, post-construction total settlement is anticipated to be less than 1 inch, provided that the foundations are designed and constructed as recommended herein. Most of the settlement is anticipated to occur from dead loads applied during the construction period.

4. Lateral Earth Pressures

Retaining walls, buried foundation walls, and other permanent retaining structures subjected to unbalanced earth-loading conditions should be designed to resist lateral earth pressures. Specific recommendations for the type and foundations for site retaining walls can be provided as the design evolves.

For the purpose of evaluating lateral earth pressures, we recommend using the following equivalent weights from IBC Section 1610.1 for preliminary design:

flexible (cantilever) walls	30 pounds/cubic foot
rigid (fixed) walls	60 pounds/cubic foot

These values are for horizontal backfill and assume that the walls are backfilled with free draining soils such as Granular Fill (provided that it has less than 8 percent passing sieve No. 200) or Sand-Gravel within at least 3 feet of the walls and provided with toe drains so that no water pressure develops behind the wall (refer to Design Item 6 below). Where the calculated earth pressure behind the wall is less than 250 pounds per square foot (psf), it should be increased to 250 psf to account for stresses created by compaction within 5 feet of the wall. Walls should also be designed for appropriate sloping backfill, surcharge (e.g., floor loads), and seismic loads per Section 1610.2 of the MSBC.

The recommended coefficient of friction to resist sliding between mass concrete/formed concrete and compacted Structural Fill is 0.4. If the concrete is placed directly on the natural silt/clay or natural sand subgrade, the recommended coefficient of friction to resist sliding is 0.25.

The minimum factors of safety for sliding and overturning under static loads should be 1.5. Passive pressure at the toe of walls should not be included as a resisting force when analyzing for overturning and sliding.

5. Geotechnical Seismic Design

Seismic Site Class

Seismic Site Class was determined as described in Section 1613.5.5 of the MSBC and the 2009 IBC using the average Standard Penetration Test (SPT) resistance method. We recommend Site Class D be used for seismic design.

In accordance with Table 1604.11 of the MSBC, the mapped spectral response acceleration parameters for the town of Plymouth are:

- S_S = 0.24g
- S_1 = 0.060g

These values are based on a Site Class B condition. The values have been scaled in accordance with Sections 1613.5.3 and 1613.5.4 of IBC 2009 to develop the site-specific design spectral response acceleration parameters:

- S_{DS} = 0.256g
- S_{D1} = 0.096g

Seismic loads on foundation walls should be calculated based on MSBC Section 1610.2, using the following parameters:

- Total Soil Unit Weight: 130 pcf
- Site Coefficient, Fa = 1.6

Liquefaction

Based on the criteria of MSBC Section 1806.4 and Figures 1806.4b, a qualitative liquefaction assessment was performed on the basis of blow count, soil type and estimated fines content. The soils at the Site are not considered susceptible to liquefaction based on the criteria set forth in the MSBC.

6. Permanent Groundwater Control

As noted above, groundwater was typically observed at depths of about 3 to 5.5 feet below existing ground surface. We anticipate that seasonal fluctuations and storm events may temporarily elevate the water table to elevations close to the existing ground surface, particularly given the presence of the relatively shallow, relatively non-pervious Silt/Clay layering within the sand deposit.

In accordance with Section 1805 of the 2009 IBC and MSBC, we recommend that the building be designed to include slab underdrains and a perimeter drain. In GZA's opinion, a perimeter drain is required along the south, east and west building walls to maintain water levels below the design ground floor elevation. The perimeter drain should be designed to discharge to a storm drain manhole on the north side of the building. In addition, the building should be designed to include an underslab drainage system to capture water that may bypass the perimeter drains and flow under the building. The underdrains should also discharge to a storm drain to the north side of the site. For preliminary design purposes, we recommend that the perimeter drain be designed based on groundwater at elevation 30 feet at the south side of the site and elevation 19 feet north side of the site.

The underdrain and perimeter drain pipes should consist of 6-inch-diameter Schedule 40 perforated PVC pipe surrounded by a minimum 6-inch annulus of ¾-inch Crushed Stone wrapped all-around in non-woven geotextile filter fabric. Any fill placed between the slab underdrain system and slab base course should consist of ¾-inch Crushed Stone to facilitate migration of groundwater towards the underdrain pipes. GZA can assist the project civil engineer with the layout of the underdrain pipes as the design evolves.

The perimeter foundation and retaining wall drains should be installed outside the foundation walls and retaining walls. Above the Crushed Stone, Sand-Gravel should be placed to within 18 inches of ground surface to allow drainage into the drain pipe.

Local, state and/or federal permits may be required depending on the drain's final discharge point.

In addition to the drainage system, waterstops and other waterproofing measures will need to be incorporated into the structural design of the base slab at locations where there are pipe penetrations or other penetrations extend through the building slab to ensure that water does not seep up into the building.

If an elevator or other sub-slab pits are planned, we recommend that they be waterproofed and designed to resist hydrostatic pressure.

7. In-Situ Hydraulic Conductivity

GZA has estimated the following hydraulic conductivity values for in-situ site soils based on a Kozeny-Carmen approach for the Existing Fill and Natural Sand Deposit and published values for the natural Silt/Clay Layers.

In-situ Soil Type	**Estimated Hydraulic Conductivity (centimeters per second)**
Existing Fill	10^{-3} to $5x10^{-5}$
Natural Sand Deposit	10^{-2} to $5x10^{-5}$
Natural Silt/Clay Layers	10^{-5} to 10^{-6}

Construction

1. Foundation Subgrade Preparation

We recommend subgrade excavation be completed "in the dry" and in accordance with the procedure outlined below. For areas of the site where groundwater is anticipated to be encountered above subgrade elevation, we have provided recommendations for construction dewatering later in this report.

Remove existing asphalt paving within the proposed structure footprint and excavate to proposed subgrade or to undisturbed natural soils, whichever is deeper. Excavation below footing subgrade should extend downward and outward at a 45-degree angle (1H:1V) from one foot beyond the bottom exterior edge of footing, down to undisturbed natural soils. Care should be taken to avoid disturbing the exposed subgrade, such as using a smooth-edged bucket during excavation. The subgrade should then be proof compacted with at least six passes of a vibratory drum roller (with a minimum static drum weight of 10,000-pounds capable of at least 20,000 pounds of dynamic force). At the discretion of the project geotechnical engineer, static proof-compaction may be required in areas with natural Silt/Clay or Sand subgrades or when near the groundwater table. At the discretion of the Geotechnical Engineer, proof-compaction of the natural Silt/Clay subgrades using a sheep's foot roller may be required.

Proof-compaction should be performed in the presence of a qualified geotechnical engineer. Weak or soft spots identified during proof-compaction should be over-excavated and replaced with compacted Structural Fill. Structural Fill material may consist of imported Granular Fill, imported Crushed Stone, or imported Sand-Gravel Fill. Recommended fill gradations are presented in Table 2. The natural subgrades are expected to be easily disturbed when wet and may require placement of a mud mat or working mat of Crushed Stone. Crushed Stone placed in excess of 4 inches thick should be wrapped all-around in non-woven geotextile filter fabric.

Where over-excavation is required to reach natural soils, raise grade to subgrade elevation with compacted Structural Fill placed in lifts no thicker than 12-inches.

Building Slab

Remove existing asphalt paving within the proposed excavation limits and excavate to proposed subgrade elevation. Where existing fill is exposed at subgrade elevation, overexcavate a minimum of 2 feet below slab base course, proof-compact the exposed subgrade as described above for footing subgrades, and replace with controlled, compacted lifts of Structural Fill.

2. Pavement Subgrade Preparation

Within new pavement areas, remove existing fill to the minimum depth required to accommodate Finish, Binder and Sand-Gravel Base courses. Existing fill below pavement base course may be left in place provided the subgrade is proof-compacted with a minimum of six passes of a vibratory drum roller (with a minimum static drum weight of 10,000-pounds capable of at least 20,000 pounds of dynamic force). Weak or soft spots identified during proof-compaction should be over-excavated and replaced with compacted Structural Fill.

3. Fill Materials and Compaction

The minimum gradation requirements for various fill materials and their recommended uses are provided in Table 2. The recommended minimum degree of compaction for Structural Fill, based on percentage of maximum dry density as defined by ASTM D-1557, is specified below for different areas. When placed, Crushed Stone should be placed in maximum 6-inch-thick lifts and compacted to a firm stable configuration. Where Crushed Stone is greater than 4 inches in thickness, it should be wrapped all-around in filter fabric.

Fill Area	Percent of Maximum Dry Density
Within Building Area and Bearing Zone of Footings*	95
Beneath Pavement (upper 2 feet)	95
More than 2 feet below Pavement	92
Outside Building & Adjacent to Exterior Building Foundations	92
Beneath Landscaped Areas	90

* Bearing zone of footings is defined by a 45 degree plane (1H:1V) extending downward and outward starting one foot laterally beyond the bottom exterior edge of footing.

Extra care should be used when compacting adjacent to walls. Where walls are buried on both sides, backfill and compaction should proceed on both sides of the wall so that the difference in top of fill on either side of the wall does not exceed 2 feet. Use hand-operated rollers or plate compactors weighing not more than 250 pounds within a lateral distance of 5 feet of walls.

Frozen soil should not be placed as fill. In addition, fill should not be placed over frozen soil. Protect footings, slabs and footing and slab subgrades from frost at all times during construction.

4. Reuse of Existing Materials

Based on visual and laboratory soil classifications, we recommend the following with respect to reuse of on-site materials:

Pavement – Existing asphalt pavements may be crushed and processed for reuse as pavement base course, provided the processed materials meet the recommended gradation requirements for Sand-Gravel base course specified herein and can be compacted to the required degree of compaction.

Fill – Portions of the existing fill may meet the recommended gradation requirements for Granular Fill. However, there are zones that contain a high percentage of silt and will not be suitable for re-use as Structural Fill (Granular Fill, Sand-Gravel or Crushed Stone).

Reuse of existing fill is considered suitable for application in landscaped areas or below pavement and possibly, below slab base course provided debris is removed and the material can be compacted to the degree required.

Natural Silt/Clay – The natural silt/clay layers are not expected to meet the requirements for Structural Fill.

Natural Sand Deposit – Portions of the natural sand deposit may meet the recommended gradation requirements for Granular Fill. Reuse of natural sand is considered suitable for application in landscaped areas or below pavement and possibly, below slab base course provided that the material can be compacted to the degree required.

We anticipate that all Crushed Stone and Sand-Gravel Fill will have to be imported to the site. The amount of imported Granular Fill required will be dependent on site grading and handling of soils during construction.

5. Disposal of Excess Soils

Excess soil generated during construction that cannot be reused on-site should be disposed of in accordance with applicable local, state and federal regulations. Off-site disposal of excess soils will require chemical precharacterization testing to evaluate potential disposal options, may require handling in accordance with the Massachusetts Contingency Plan, and may result in premium construction costs. As noted above, the McMahon Site Selection Study Report and the June 2012 Phase I Preliminary Site Assessment indicated that the site had a documented release of hydraulic oil and a removed former Underground Storage Tank (UST). The report also recommended that additional environmental studies be performed. The results of these assessments and studies should be considered during planning and construction as they relate to reuse of site soils.

If excess excavated existing fill soils are unable to be reused, off-site disposal/reuse at a landfill or at an appropriately licensed facility may be required, pending further evaluation and laboratory testing. Off-site disposal at these types of facilities would result in premium costs. As such, site grading should be designed to limit off-site soil disposal and the contractor required to reuse on site soil where possible. Disposal of excess excavated soils should be performed in accordance with local, state and federal laws and regulations.

6. Construction Dewatering

Based on groundwater measurements obtained during the subsurface exploration program, excavation for the installation of the building foundations and associated utilities will likely extend below the groundwater table. Therefore, construction dewatering will likely be required to conduct work “in the dry”. The Site Contractor should be responsible for selected dewatering methods and designing dewatering systems, based upon his proposed methods and equipment needed for excavation.

Based on a review of existing soil conditions, it is anticipated that construction dewatering may be able to be achieved with localized sump pumps with discharge on-site into excavated pits located outside of the building area. However, due to the relatively shallow

groundwater levels observed at the site, on-site discharge may not be feasible at all times. Thus, construction dewatering discharge may require off-site disposal.

Discharge of pumped water off-site (if required) should be performed in accordance with all federal, state, and/or local regulations, which may require a discharge permit, possible filtration, treatment, and chemical testing of the water prior to discharge.

In addition, water that collects from precipitation events may also impact construction. It is recommended that temporary control measures be implemented to reduce the amount of surface water (from rainfall runoff) from potentially entering and ponding in the excavations. Temporary measures should include, but not be limited to, construction of drainage ditches to divert and/or reduce the amount of surface water flowing over exposed subgrades during construction.

7. Excavation Slopes and Shoring

Since the location of the building footprint and required depth of excavation have not yet been determined, it is not yet known if a temporary earth support system will be required. Proximity of proposed excavations to adjacent structures, including Memorial Hall, is unknown at this time. Where sufficient space is not available to safely lay back excavations, a temporary earth support system will be required. Temporary earth support systems, if required, should be selected by the Site Contractor and designed by an experienced Professional Engineer registered in the Commonwealth of Massachusetts, and retained by the Contractor.

As a minimum, the Owner and the Contractor should make themselves aware of and become familiar with applicable local, state, and federal safety regulations, including the current Occupational Safety and Health Administration (OSHA) Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing this information solely as a service to our Client. Under no circumstances should the information provided below be interpreted to mean that GZA is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

The Contractor should be aware that slope height, slope inclination, or excavation depth (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations, e.g.; OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations. Such regulations are strictly enforced and, if they are not followed, the Owner, Contractor, and/or earthwork and utility subcontractors could be liable for substantial penalties.

As a safety measure, it is recommended that all vehicles and soil stockpiles be kept a minimum lateral distance from the crest of the slope equal to no less than the slope height. Exposed slope faces should also be protected against the elements.

FINAL DESIGN AND CONSTRUCTION SERVICES

We trust the information presented herein is sufficient for your use in the preliminary design of the proposed PT&VC. As the design progresses with regard to the location of the building

footprint and depth of excavation (and required filling), GZA requests that we be retained to review and revise the relevant recommendations provided in this report.

As the design of the PV&TC progresses toward final design, GZA recommends that two to three observation wells be installed at the site and monitored to provide stabilized groundwater elevation data for use in confirming the recommendations presented in this report relative to base slab design and drainage systems. We understand that a Phase II Environmental Site Assessment (ESA) may be performed by others at the site. If this investigation has not yet been performed, then these observation wells could be incorporated into the scope of the Phase II. It is also possible that wells are already required as part of the Phase II ESA scope of work.

GZA's current scope includes preparation of outline specifications related to earthwork, dewatering, and temporary earth support and providing a limited review of cost estimates related to foundations during Schematic Design.

We recommended that GZA be retained for the following additional services:

- Prepare final specifications, including specifications for earthwork, dewatering, temporary earth support and excess soil management.
- Review near-final foundation design and grading plans for conformance with our recommendations and understanding of the project.
- Review Contractor's geotechnical-related submittals for general conformance with our recommendations and the project foundation plans and geotechnical specifications.
- Observe and document earthwork and footing subgrade preparation for general conformance with our report recommendations and the project foundation plans and geotechnical specifications.

The MSBC requires that a Professional Engineer (P.E.) registered in Massachusetts (or the P.E.'s representative) observe foundation installation and fill placement in building areas.

CLOSING

We appreciate the opportunity to assist you on this phase of the project and look forward to assisting you as it moves toward final design. Please call Jon Andrews at (781) 278-5808 or Terese Kwiatkowski (781) 278-3817 with any questions.

Very truly yours,
GZA GEOENVIRONMENTAL, INC.

Jonathan D. Andrews, P.E.
Senior Project Manager

William H. Hover
Consultant/ Reviewer

Terese M. Kwiatkowski, P.E.
Principal

Attachments: Tables
Figures
Appendix A - Limitations
Appendix B – Logs of Subsurface Explorations
Appendix C –Laboratory Test Results

J:\170,000-179,999\171716\171716-00.JDA\REPORT\171716-00_REPORT_BODY_FINAL 12-5-13.DOC

Tables

Table 1 - Groundwater Observations

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

Boring ID	Date	Time of Reading (military time)	Stabilization Time (minutes, except as indicated)	Approx. Ground Surface El. (ft)[1]	Approx. Water Level Depth (ft)[2,3]	Approx. Water Level Elevation (ft)
GZ-1	7/19/2013	1015	18	28	5.5	22.5
GZ-2	7/19/2013	1336	0	26.5	4.4	22.1
GZ-2	7/19/2013	1353	17	26.5	4.4	22.1
GZ-3	7/23/2013	1300	15	23.5	5.9	17.6
GZ-4	7/22/2013	1415	20	17.5	3.5	14
GZ-5	7/18/2013	1218	36	29.5	0	29.5
GZ-5	7/22/2013	0700	64 hours	29.5	4.5	25
GZ-5	7/22/2013	1400	15	29.5	3.7	25.8
GZ-6	7/19/2013	0655	16 hours	27.5	4.7	22.8
GZ-7	7/18/2013	1126	5	26.5	3.7	22.8
GZ-7	7/18/2013	1222	0	26.5	0.8	25.7
GZ-7	7/18/2013	1227	5	26.5	1.8	24.7
GZ-7	7/18/2013	1233	5	26.5	3.7	22.8
GZ-8	7/23/2013	1440	5	25.0	3.7	21.3
GZ-10	7/23/2013	1002	10	20.0	3.2	16.8
GZ-11	7/23/2013	0945	10	18.5	3.1	15.4

Notes:

1. Ground surface elevations are relative to the National Geodetic Vertical Datum of 1929 and were estimated from a drawing prepared by Nitsch Engineering entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA," dated 10/24/2011.
2. The water level readings were performed during drilling at the times and under the conditions noted in the boring logs. It should be noted that fluctuations in groundwater levels may occur due to variations in season, rainfall, tide, site features and other factors different from those existing at the time of the explorations and measurements.
3. The water level readings were obtained using a weighted tape and the depths are relative to the existing ground surface. These readings should only be considered accurate to the degree implied by the method used.

TABLE 2
RECOMMENDED USE AND GRADATION CRITERIA FOR IMPORTED FILL MATERIALS
Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, MA

USE OF FILL MATERIAL

Granular Fill: Backfill below foundations, below slab base course or below pavement base course

Sand-Gravel: Pavement base course, and as backfill within three feet laterally of walls

Crushed Stone: Slab Base Course, and for use in bottom of foundation excavations to aid in construction dewatering and maintaining subgrade stability during wet conditions, and around perforated drain lines/sub-slab foundation drains.

GRADATION REQUIREMENTS

Granular Fill shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. Structural Fill shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight
2/3 of the loose lift thickness	100
No. 10	30 - 95
No. 40	10 - 70
No. 200	0 - 15

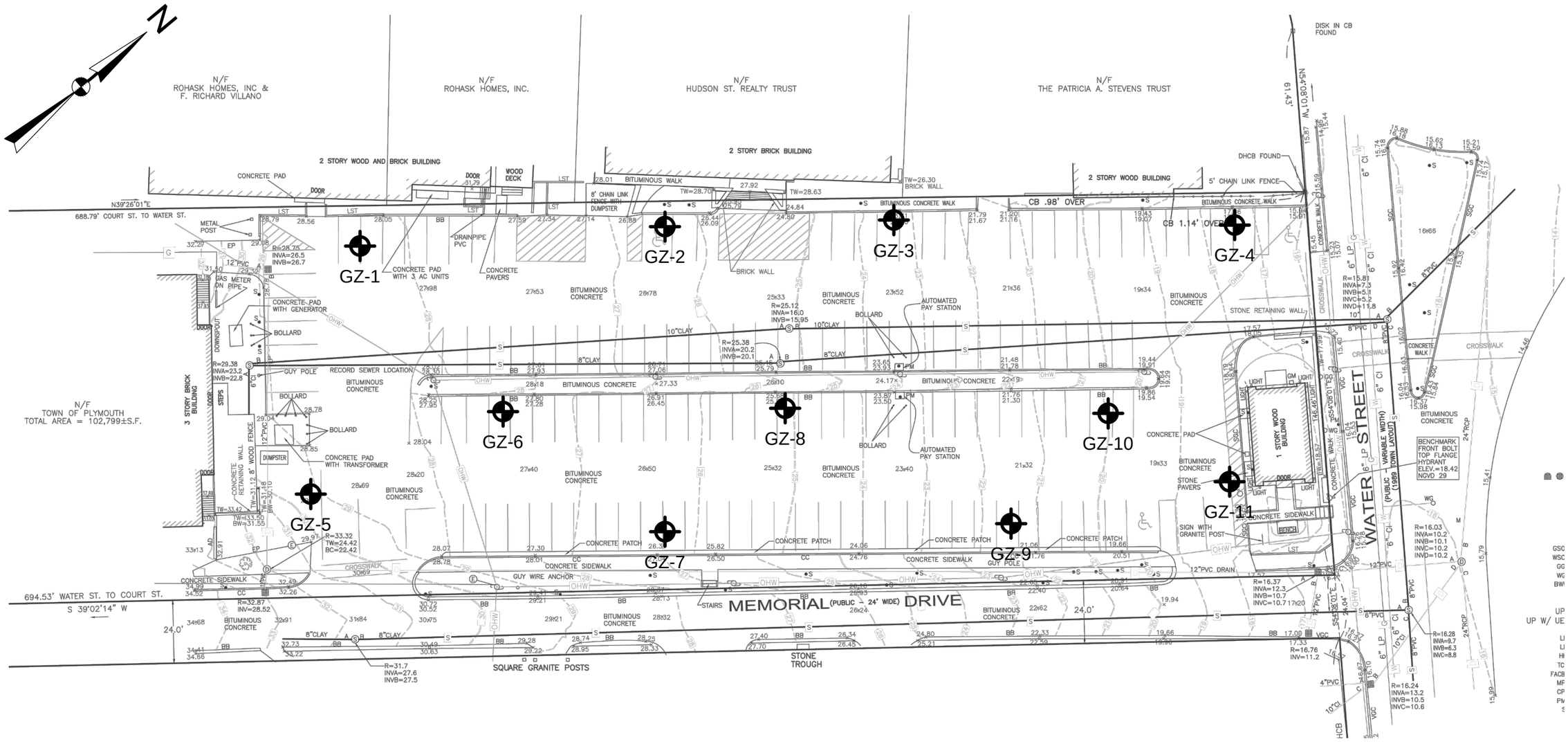
Sand-Gravel shall consist of durable sand and gravel and shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. Sand-Gravel shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight
3 inch	100
1/2 inch	50 - 85
No. 4	40 - 75
No. 40	10 - 35
No. 200	0 - 8

Crushed Stone shall consist of durable crushed rock or durable crushed gravel stone and shall be free from ice and snow, clay, loam and other deleterious material. Crushed Stone shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight
1 inch	100
3/4 inch	90 - 100
1/2 inch	10 - 50
3/8 inch	0 - 20
No. 4	0 - 5

Figures



LEGEND

GZ-1

APPROXIMATE LOCATION OF TEST BORING PERFORMED BY NEW HAMPSHIRE BORING, INC. OF BROCKTON, MASSACHUSETTS BETWEEN JULY 17 AND 23, 2014. OBSERVED AND LOGGED BY GZA PERSONNEL.

0 20 40 80

SCALE IN FEET

NOTES:

1. BASE PLAN OBTAINED FROM A PDF FILE OF A DRAWING ENTITLED TOPOGRAPHIC PLAN, MUNICIPAL PARKING LOT, MEMORIAL DRIVE PLYMOUTH, MASSACHUSETTS, PREPARED BY NITSCH ENGINEERING, DATED 10/25/2011.
2. THE BORINGS WERE APPROXIMATELY DETERMINED BY TAPE MEASUREMENT FROM EXISTING FEATURES. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHODS USED.

PLYMOUTH PARKING GARAGE
PLYMOUTH, MA

EXPLORATION LOCATION PLAN

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		TOWN OF PLYMOUTH	
PROJ MGR: JDA	REVIEWED BY: TMK	CHECKED BY: JDA	FIGURE 1
DESIGNED BY: JBH	DRAWN BY: CFR	SCALE: AS NOTED	
DATE: 08-12-2013	PROJECT NO. 01.0171716-00	REVISION NO.	

Appendix A

Limitations

GEOTECHNICAL LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report,as appropriate, to reflect the unanticipated changed conditions .

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Subsurface Conditions

4. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs.

5. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

6. Water level readings have been made in test holes (as described in the Report) at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

7. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

8. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

9. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Additional Services

10. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

Appendix B

Logs of Subsurface Explorations

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-1
SHEET: 1 of 1
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: N. Stuttard

Type of Rig: Truck
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 28
Final Boring Depth (ft.): 26
Date Start - Finish: 7/9/2013 - 7/19/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/19/13	1015	5.5	18 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0.5-2.5	24	16	6 5 4 4	S-1 : Top 8": Dark brown, fine to coarse SAND, little Silt, little Gravel, trace Wood Fragments	1 2	0.2	0.5	ASPHALT	27.5
							Bottom 8": Gray, fine to coarse SAND and CLAY & SILT	3	0.4		FILL	
		S-2	2.5-4.5	24	12	9* 12* 13* 11*	S-2 : Medium dense, gray with brown areas, SILT and fine to coarse SAND, trace Gravel					
5		S-3	4.5-6.5	24	9	10 10 10 12	S-3 : Very stiff, gray and orange-brown, SILT & CLAY, trace fine to coarse Sand		0.2	4.5		23.5
		S-4	6.5-8.5	24	10	13* 14* 13* 16*	S-4 : Very stiff, gray and orange-brown, Clayey SILT, little fine Sand	4	0		CLAYEY SILT	
10										10		18.0
15		S-5	14-16	24	8	23 15 13 17	S-5 : Medium dense, brown, fine to coarse SAND, trace Silt	5	ND		SAND	
20		S-6	19-21	24	9	11 7 8 8	S-6 : Medium dense, brown, fine to coarse SAND and GRAVEL, trace (-) Silt		ND			
25		S-7	24-26	24	1	13 9 5 6	S-7 : Medium dense, brown, fine to coarse SAND, trace Gravel, trace Silt (1-inch of fine Sand, little Silt in tip of spoon)	6	ND	26		2.0
							End of exploration at 26 feet.	7				
30												

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
4 - Observed that the drilling contractor maintained a positive head on the borehole while extracting the drill bit below a depth of 9-feet.
5 - Observed that the borehole was cased using 4-inch diameter casing to 14-feet in depth and the driller advanced the drill bit to 19-feet in depth. It was observed that the borehole collapsed from 16 to 19-feet in depth.
6 - Split spoon sample S-7 obtained a recovery of 1-inch (Brown, fine SAND, little Silt), subsequently the driller drove a 3-inch diameter split spoon and obtained a recovery 8-inches of soil. The soil description is based upon the recovery of the 3-inch diameter split spoon.
7 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-1

GZA TEMPLATE TEST BORING 300; 12/4/2013; 10:57:12 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-2
SHEET: 1 of 1
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: N. Stuttard

Type of Rig: Truck
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 26.5
Final Boring Depth (ft.): 26
Date Start - Finish: 7/19/2013 - 7/19/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/19/13	1336	4.4	0 min.
7/19/13	1353	4.4	17 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	1-3	24	7	13 19 12 14	S-1 : Dense, brown, fine to medium SAND, little fine Gravel, trace Silt	1 2 3	1.4 0.2		FILL	
		S-2	3-5	24	16	17* 20* 26* 25	S-2 : Dense, brown, fine to medium SAND, trace Silt					
5		S-3	5-7	24	14	22 26 18 17	S-3 : Top 7": Dark brown, fine to coarse SAND, little Silt, trace Gravel Bottom 7": Light brown, fine to medium SAND, trace Silt		0.4	5		21.5
		S-4	7-9	24	10	22* 18* 14* 17*	S-4 : Dense, brown, fine to medium SAND, trace Silt		ND		SAND	
10		S-5	9-11	24	16	21 25 19 12	S-5 : Top 6": Red-brown, fine to medium SAND, little Silt Bottom 10": Gray, fine to medium SAND, some Silt	4	ND	12		14.5
15		S-6	14-16	24	18	3 5 17 16	S-6 : Top 18": Brown, CLAY & SILT Bottom 6": Brown, fine to coarse SAND, trace Silt, trace Gravel		ND		CLAY & SILT	
										15		11.5
20		S-7	19-21	24	14	9 11 13 14	S-7 : Top 8": Brown-orange, fine to coarse SAND, trace Gravel, trace Silt Bottom 6": Brown, fine to coarse SAND, little Silt, little Gravel (1 piece)		ND		SAND	
25		S-8	24-26	24	8	20 11 13 12	S-8 : Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt		ND			
							End of exploration at 26 feet.	5		26		0.5
30												

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
4 - Observed that the drilling contractor maintained a positive head on the borehole while extracting the drill bit below a depth of 9-feet.
5 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-2

GZA TEMPLATE TEST BORING 300; 12/4/2013; 10:57:15 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-3
SHEET: 1 of 1
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: C. Knight

Type of Rig: ATV
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 23.5
Final Boring Depth (ft.): 26
Date Start - Finish: 7/23/2013 - 7/23/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/23/13	1300	5.9	15 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
								1		0.5	ASPHALT	23.0
		S-1	1-3	24	6	12 9 9 9	S-1 : Medium dense, brown, GRAVEL and fine to coarse SAND, trace Silt	2				
								3			FILL	
		S-2	3-5	24	6	9* 7* 12* 12*	S-2 : Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt					
5		S-3	5-7	24	12	7 9 9 9	S-3 : Medium dense, brown, fine to medium SAND, trace Silt, trace Gravel			5		18.5
		S-4	7-9	24	12	20* 30* 38* 42*	S-4 : Very dense, brown, fine to coarse SAND, little Gravel, trace Silt					
10								4			SAND	
15		S-5	14-16	24	12	19 22 29 36	S-5 : Very dense, brown, fine to coarse SAND, little Gravel, trace Silt					
										18		5.5
20		S-6	19-21	24	6	8 14 17 20	S-6 : Very stiff, gray, Silty CLAY				SILTY CLAY	
										22		1.5
25		S-7	24-26	24	4	23 27 21 36	S-7 : Very dense, brown, fine to medium SAND, little Silt				SAND	
										26		-2.5
							End of exploration at 26 feet.	5				
30												

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
4 - Observed that the drilling contractor maintained a positive head on the borehole while extracting the drill bit below a depth of 9-feet.
5 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-3

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-4
SHEET: 1 of 2
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: N. Stuttard

Type of Rig: Truck
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 17.5
Final Boring Depth (ft.): 61
Date Start - Finish: 7/22/2013 - 7/22/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/22/13	1415	3.5	20 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data
		S-1	1-3	24	9	10 6 4 5	S-1 : Medium dense, brown, fine to medium SAND, some Silt, little Gravel	1 2 3	0.2
		S-2	3-5	24	16	6* 7* 7* 14*	S-2 : Top 4": Dark gray, fine to coarse SAND, some Silt, little Gravel	4 5	0.2
5		S-3	5-7	24	8	15 9 6 6	Bottom 12": Brown, fine to coarse SAND, little (+) Gravel, little Silt		0.2
		S-4	7-9	24	19	8* 13* 20* 13*	S-3 : Medium dense, brown, fine to coarse SAND, little (+) Gravel, little Silt		0.2
							S-4 : Top 15": Brown, fine to coarse SAND, trace Gravel, trace Silt		ND
10							Bottom 4": Brown, fine to medium SAND, some Silt	6	ND
15		S-5	14-16	24	20	9 10 14 16	S-5 : Very stiff, gray, Silty CLAY, varved with three (1/16 inch minus thick) lens of fine Sand and Silt (spaced approximately 2 inches apart)		ND
20		S-6	19-21	24	12	6 7 11 11	S-6 : Very stiff, gray, Silty CLAY		ND
								7	ND
25		S-7	24-26	24	15	11 8 5 6	S-7 : Top 7": Brown, fine to medium SAND, little Silt Bottom 8": Olive, Silty CLAY with varves of fine Sand, some Silt (1/16 inch minus thick) spaced 1/4 to 1 inch apart		
30		S-8	29-31	24	22	4 5 4 4	S-8 : Stiff, brown, CLAY & SILT and fine SAND with a single 1/4 inch thick lens of Silty Clay		ND

Depth (ft.)	Stratum Description	Elev. (ft.)
	FILL	
7		10.5
	SAND	
12		5.5
	SILTY CLAY	
23		-5.5
	SAND	
24		-6.5
	CLAY & SILT	
33		-15.5

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
4 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
5 - Observed that the split spoon sample S-1 appeared to be dry and that the split spoon sample S-2 appeared to be saturated, as well as all subsequent split spoon samples.
6 - Observed that the drilling contractor maintained a positive head on the borehole while extracting the drill bit below a depth of 9-feet.
7 - Observed an increase in drilling resistance at a depth of 23-feet.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-4

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-4
SHEET: 2 of 2
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: N. Stuttard

Type of Rig: Truck
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 17.5
Final Boring Depth (ft.): 61
Date Start - Finish: 7/22/2013 - 7/22/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/22/13	1415	3.5	20 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
35		S-9	34-36	24	12	5 5 5 5	S-9 : Medium dense, brown, fine to medium SAND and SILT		ND		SAND AND SILT	
										37.5		-20.0
40		S-10	39-41	24	11	15 22 24 22	S-10 : Dense, brown-orange, fine to coarse SAND, little Gravel, trace Silt		ND			
45		S-11	44-46	24	9	19 33 28 29	S-11 : Very dense, fine to medium SAND, trace Silt		ND			
50		S-12	49-51	24	18	32 26 22 25	S-12 : Dense, brown with orange, fine to medium SAND, trace Silt		ND		SAND	
55		S-13	54-56	24	8	28 32 34 27	S-13 : Very dense, brown, fine to coarse SAND, little Gravel, little Silt		ND			
60		S-14	59-61	24	8	29 39 42 38	S-14 : Very dense, brown, fine to coarse SAND, little Gravel, trace Silt		ND			
										61		-43.5
							End of exploration at 61 feet.	8				
65												

REMARKS

8 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-4

GZA TEMPLATE TEST BORING 300; 12/4/2013; 10:57:18 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-5
SHEET: 1 of 3
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: C. Knight

Type of Rig: Tracked Moordoka
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 29.5
Final Boring Depth (ft.): 101
Date Start - Finish: 7/18/2013 - 7/18/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW & NW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/18/13	1218	0	36 min.
7/22/13	0700	4.5	64 hours
7/22/13	1400	3.7	15 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0.3-2.3	24	18	14 12 9 15	S-1 : Top 6": Dark gray, fine to coarse SAND, little Gravel, little Silt	1 2	0.2	0.2	ASPHALT	29.3
		S-2	2.3-4.3	24	12	19* 26* 20* 22*	Bottom 2": Brown, fine to coarse SAND, little (-) Gravel, trace Silt	3	0.2		FILL	
							S-2 : Dense, brown, fine to coarse SAND, trace Gravel, trace Silt		0.4	4.3		25.2
5		S-3	4.3-6.3	24	16	10 12 20 25	S-3 : Dense, brown, fine to coarse SAND, trace Silt					
		S-4	6.3-8.3	24	14	20* 14* 19* 17*	S-4 : Dense, brown, fine to coarse SAND, little (-) Silt, trace Gravel		0.2			
10								4 5				
15		S-5	14-16	24	12	11 14 21 18	S-5 : Dense, brown, fine to coarse SAND, trace Silt		ND			
20		S-6	19-21	24	17	14 22 23 20	S-6 : Dense, brown, fine to coarse SAND, little Gravel, trace Silt		ND		SAND	
25		S-7	24-26	24	12	6 9 10 13	S-7 : Medium dense, brown, fine to coarse SAND, trace Silt		ND			
30		S-8	29-31	24	14	6 7 23 28	S-8 : Top 8": Brown, fine to medium SAND, trace Silt Bottom 6": Brown-orange, fine to coarse SAND, some Gravel, little (-) Silt		ND	34		-4.5

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
4 - At a depth of 9-feet the driller added half a bag of "Super Gel-x" to the drilling fluid.
5 - Observed that the drilling contractor maintained a positive head on the borehole wile extracting the drill bit below a depth of 9-feet.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-5

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-5
SHEET: 2 of 3
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: C. Knight

Type of Rig: Tracked Moordoka
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 29.5
Final Boring Depth (ft.): 101
Date Start - Finish: 7/18/2013 - 7/18/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW & NW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/18/13	1218	0	36 min.
7/22/13	0700	4.5	64 hours
7/22/13	1400	3.7	15 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
35		S-9	34-36	24	8	21 40 23 27	S-9 : Hard, gray, SILT & CLAY		ND		SILT & CLAY	
										38		-8.5
40		S-10	39-41	24	11	23 29 35 45	S-10 : Very dense, brown, fine to medium SAND, little Silt, trace Gravel		ND		SAND	
								6		42.5		-13.0
45		S-11	44-46	24	13	19 18 28 55	S-11 : Hard, brown, CLAY & SILT, little fine Sand		ND		CLAY & SILT	
										48		-18.5
50		S-12	49-51	24	12	22 35 40 47	S-12 : Very dense, brown, fine SAND, little Silt		ND			
55		S-13	54-56	24	15	22 44 45 37	S-13 : Very dense, brown, fine to medium SAND, little (-) Silt		ND		SAND	
60		S-14	59-61	24	9	14 27 27 38	S-14 : Very dense, brown, fine to medium SAND, little (-) Silt	7	ND			
								8				
65		S-15	64-66	24	15	20 25 34 31	S-15 : Very dense, brown, fine to medium SAND, trace Silt		ND			

REMARKS

6 - Observed an increase in drilling resistance at a depth of 42.5-feet.
7 - The driller informed the undersigned that a positive head was not maintained for split spoon sample S-14.
8 - At a depth of 62-feet the driller added half a bag of "Quick-Gel Bentonite" to the drilling fluid.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-5

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-5
SHEET: 3 of 3
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: C. Knight

Type of Rig: Tracked Moordoka
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 29.5
Final Boring Depth (ft.): 101
Date Start - Finish: 7/18/2013 - 7/18/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW & NW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/18/13	1218	0	36 min.
7/22/13	0700	4.5	64 hours
7/22/13	1400	3.7	15 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
70		S-16	69-71	24	12	22 34 44 48	S-16 : Very dense, brown, fine to medium SAND, trace Silt		ND			
75		S-17	74-76	24	14	26 42 37 39	S-17 : Very dense, brown, fine to medium SAND, trace Silt	9	ND		SAND	
80		S-18	79-81	24	15	24 29 41 45	S-18 : Very dense, brown, fine to medium SAND, trace Silt		ND			
85		S-19	84-86	24	15	20 28 35 28	S-19 : Very dense, brown, fine to medium SAND, trace Silt		ND	87.5		-58.0
								10		88.5	BOULDER	-59.0
90		S-20	89-91	24	8	53 35 25 27	S-20 : Very dense, brown, fine to coarse SAND, some Gravel, trace Silt	11 12	ND			
95		S-21	94-96	24	13	31 55 41 59	S-21 : Very dense, brown, fine to coarse SAND, little Gravel, trace Silt		ND		SAND	
100		S-22	99-101	24	12	24 46 38 42	S-22 : Very dense, brown, fine to medium SAND, trace Silt		ND			
							End of exploration at 101 feet.	13		101		-71.5

REMARKS

9 - At a depth of 73-feet the driller added half a bag of "Quick-Gel Bentonite" to the drilling fluid.
10 - Observed a significant increase in drilling resistance from an approximate depth of 87.5 to 88.5-feet.
11 - Upon arrival on-site on 7/22/13, it was observed that 10 feet of the drill rods had become clogged with fine to medium sand. Split spoon sample S-20 was left down at the bottom of the borehole over the weekend.
12 - After removing split spoon sample S-20, the driller utilized 3-inch diameter casing for the remainder of the test boring.
13 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-5

GZA TEMPLATE TEST BORING 300; 12/4/2013; 10:57:20 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-6
SHEET: 1 of 1
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: N. Stuttard

Type of Rig: Truck
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 27.5
Final Boring Depth (ft.): 26
Date Start - Finish: 7/18/2013 - 7/18/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/18/13	1500	Above GS	10 min.
7/19/13	0655	4.7	16 hours

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
								1		0.3	ASPHALT	27.2
		S-1	1-3	24	12	7 8 3 3	S-1 : Medium dense, dark gray, fine to medium SAND and SILT, little Gravel	2	0.2			
								3			FILL	
		S-2	3-5	24	14	6* 8* 3* 3*	S-2 : Medium dense, gray, fine to coarse SAND and SILT		0.2			
5		S-3	5-7	24	17	18 15 17 16	S-3 : Dense, brown and gray, fine to coarse SAND and CLAY & SILT		0.2	5		22.5
		S-4	7-9	24	18	15* 20* 25* 24*	S-4 : Very stiff, brown, gray and red-orange, CLAY & SILT, little fine Sand		0.2		CLAY & SILT	
10								4				
										12		15.5
15		S-5	14-16	24	18	8 8 10 13	S-5 : Medium dense, brown, fine to medium SAND, some (-) Silt (observed two 1/16 inch thick lenses of fine to coarse SAND, trace Silt)		ND			
20		S-6	19-21	24	6	10 10 9 10	S-6 : Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt		ND		SAND	
25		S-7	24-26	24	8	9 7 7 7	S-7 : Medium dense, brown, fine to medium SAND, some Gravel, trace Silt		ND			
										26		1.5
30							End of exploration at 26 feet.	5				

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
4 - Observed that the drilling contractor maintained a positive head on the borehole while extracting the drill bit below a depth of 9-feet.
5 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-6

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-7
SHEET: 1 of 1
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: N. Stuttard

Type of Rig: Wheeled
Rig Model: CME 75
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 26.5
Final Boring Depth (ft.): 26
Date Start - Finish: 7/18/2013 - 7/18/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/18/13	1222	0.8	0 min.
7/18/13	1227	1.8	5 min.
7/18/13	1235	3.7	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		S-1	0.3-2.3	24	14	14 13 12 12	S-1 : Top 10": Dark gray, fine to coarse SAND, little Gravel, little Silt Bottom 4": Gray, fine to coarse SAND, little (+) Silt, little Gravel	1 2	0.4	0.3	ASPHALT	26.2
		S-2	2.3-4.3	24	14	20* 19* 21* 20*	S-2 : Dense, gray and brown, fine to coarse SAND, little (+) Silt, little Gravel	3	0.2		FILL	
5		S-3	4.3-6.3	24	16	18 16 17 17	S-3 : Dense, brown and reddish-orange, fine to medium SAND, little Silt		0.2	4		22.5
		S-4	6.3-8.3	24	18	16* 16* 18* 18*	S-4 : Hard, gray with reddish-orange, Clayey SILT, some fine Sand		ND		SAND	
10		S-5	9-11	24	18	14 9 13 16	S-5 : Top 14": Gray with reddish-orange, SILT & CLAY, trace fine Sand Bottom 4": Brown, fine to medium SAND, trace Silt	3	ND ND	6.3	CLAYEY SILT	20.2
15		S-6	14-16	24	12	8 7 9 8	S-6 : Medium dense, brown, fine to coarse SAND, little Gravel, trace Silt		ND	10		16.5
20		S-7	19-21	24	6	10 7 8 10	S-7 : Medium dense, brown, fine to coarse SAND, trace Silt, trace Gravel		ND		SAND	
25		S-8	24-26	24	0	12 8 8 9	S-8 : 2" Spoon: GRAVEL 3" Spoon: Brown, fine to coarse SAND, little Gravel, trace Silt	4	ND 4	26		0.5
30							End of exploration at 26 feet.	5				

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
3 - Observed that the drilling contractor maintained a positive head on the borehole while extracting the drill bit below a depth of 8.3-feet.
4 - Split spoon sample S-8 was observed to have a piece of gravel stuck in the tip of the split spoon. The driller placed the 2-inch diameter split spoon at the bottom of the borehole and drove it 2-feet and obtained no recovery. The driller subsequently placed the 3-inch diameter split spoon at the bottom of the borehole and drove it 2-feet and obtained 6-inches of recovery.
5 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-7

GZA TEMPLATE TEST BORING 300; 12/4/2013; 10:57:23 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-8
SHEET: 1 of 1
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: C. Knight

Type of Rig: ATV Mooroka
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 25
Final Boring Depth (ft.): 26
Date Start - Finish: 7/23/2013 - 7/23/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/23/13	1440	3.7	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
								1		0.4	ASPHALT	24.6
		S-1	1-3	24	18	9 10 10 15	S-1 : Medium dense, brown, fine to medium SAND, little Silt	2 3	0.2		FILL	
								4		4		21.0
5		S-2	4-6	24	12	8 17 21 26	S-2 : Dense, brown, fine to medium SAND, trace Silt		0.2			
								5				
10		S-3	9-11	24	10	29 44 46 42	S-3 : Top 6": Very dense, brown, fine to coarse SAND, trace Gravel, trace Silt Bottom 4": Red-orange, fine to coarse SAND, trace Gravel, trace Silt		ND			
15		S-4	14-16	24	12	15 31 32 30	S-4 : Very dense, brown, fine to coarse SAND, little Gravel, trace (-) Silt		ND		SAND	
20		S-5	19-21	24	17	20 40 47 47	S-5 : Very dense, brown, fine to coarse SAND, some Gravel, trace (-) Silt		ND			
25		S-6	24-26	24	9	22 30 30 40	S-6 : Very dense, brown, fine to coarse SAND and GRAVEL, trace (-) Silt		ND			
										26		-1.0
30							End of exploration at 26 feet.	6				

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
4 - Continuous sampling between three and four feet was not performed due to project time constraints.
5 - Observed that the drilling contractor maintained a positive head on the borehole while extracting the drill bit below a depth of 6-feet.
6 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-8

GZA TEMPLATE TEST BORING 300; 12/4/2013; 10:57:24 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-9
SHEET: 1 of 1
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: N. Stuttard

Type of Rig: Truck
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 21.5
Final Boring Depth (ft.): 26
Date Start - Finish: 7/23/2013 - 7/23/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
No	measurements	taken	

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
		S-1	1-3	24	3	6 7 9 8	S-1 : Medium dense, brown, fine to coarse SAND, some Silt, little (-) Gravel	1 2 3			FILL	
		S-2	3-5	24	9	12 13 11 9	S-2 : Medium dense, brown-orange, fine to medium SAND, trace Silt					
5		S-3	5-7	24	14	14 12 14 24	S-3 : Medium dense, brown, fine to medium SAND, trace Silt			5		16.5
		S-4	7-9	24	14	28* 24* 27* 22*	S-4 : Very dense, brown, fine to coarse SAND, some (-) Gravel, trace Silt (observed top 12" brown, bottom 6" orange-red)	3			SAND	
10										12		9.5
											SANDY SILTY CLAY	
15		S-5	14-16	24	18	10 10 20 20	S-5 : Top 9": Gray, Silty CLAY and fine to coarse SAND Bottom 9": Brown, fine to coarse SAND, trace Silt			15		6.5
											SAND	
20		S-6	19-21	24	20	13 14 16 13	S-6 : Top 10": Brown, fine to medium SAND, trace Silt Bottom 10": Gray, Silty CLAY			20		1.5
											SILTY CLAY	
25		S-7	24-26	24	18	6 8 7 10	S-7 : Stiff, gray, Silty CLAY varved with fine to medium Sand, little Silt (1/4 inch thick) spaced 1 to 4 inches apart			26		-4.5
							End of exploration at 26 feet.	4				
30												

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
3 - Observed that the drilling contractor maintained a positive head on the borehole while extracting the drill bit below a depth of 9-feet.
4 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-9

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-10
SHEET: 1 of 1
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: C. Knight

Type of Rig: ATV
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 20
Final Boring Depth (ft.): 26
Date Start - Finish: 7/23/2013 - 7/23/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/23/13	1002	3.2	10 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
								1				
		S-1	1-3	24	8	10 8 12 12	S-1 : Medium dense, black and gray, fine to medium SAND, little Silt	2 3			FILL	
		S-2	3-5	17	4	17* 46* 100/5"*	S-2 : Very dense, brown, fine to coarse SAND, little Gravel, trace Silt	3				
5		S-3	5-7	24	12	10 11 30 40	S-3 : Dense, brown, fine to medium SAND, trace Silt, trace Gravel			5		15.0
		S-4	7-9	24	20	25* 35* 50* 57*	S-4 : Very dense, brown, fine to medium SAND, trace Silt, trace Gravel				SAND	
10										11		9.0
15		S-5	14-16	24	9	13 15 19 21	S-5 : Hard, gray, Silty CLAY					
											SILT & CLAY	
20		S-6	19-21	24	9	36 42 36 23	S-6 : Hard, gray, SILT & CLAY					
25		S-7	24-26	24	14	6 7 7 11	S-7 : Stiff, gray, Clayey SILT			26		-6.0
							End of exploration at 26 feet.	4				
30												

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
3 - Observed that a piece of gravel was stuck in the tip of split spoon sample S-2.
4 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-10

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Plymouth Parking Garage
Water Street and Memorial Drive
Plymouth, Massachusetts

EXPLORATION NO.: GZ-11
SHEET: 1 of 1
PROJECT NO: 171716
REVIEWED BY: MJO

Logged By: D. Wolongevicz
Drilling Co.: New Hampshire Boring
Foreman: N. Stuttard

Type of Rig: Truck
Rig Model: D-50
Drilling Method: Drive and Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 18.5
Final Boring Depth (ft.): 26
Date Start - Finish: 7/23/2013 - 7/23/2013

H. Datum:
V. Datum: NGVD 29

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4.5"/4"

Sampler Type: Split Spoon
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: HW

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
7/23/13	0945	3.1	10 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
										0.3	ASPHALT	18.2
		S-1	1-3	24	12	7 4 7 8	S-1 : Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel	1 2 3	0.2			
		S-2	3-5	24	12	4 2* 6* 7	S-2 : Loose, brown, fine to coarse SAND, some Silt, trace Gravel	4	0.4			
5		S-3	5-7	24	7	12 11 11 9	S-3 : Medium dense, brown-gray, fine to coarse SAND, little Silt, trace Gravel		0.2		FILL	
		S-4	7-9	24	7	7 6 9 5	S-4 : Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel		0.1			
10		S-5	9-11	24	0	5 4 6 5	S-5 : Stiff, gray, CLAY & SILT	5	0.2	9		9.5
15		S-6	14-16	24	10	7 8 9 9	S-6 : Very stiff, gray, Silty CLAY		ND		SILTY CLAY	
20		S-7	19-21	24	9	18 12 12 10	S-7 : Very stiff, gray, Silty CLAY		ND			
25		S-8	24-26	24	18	7 8 7 7	S-8 : Stiff, gray, CLAY & SILT		ND	26		-7.5
30							End of exploration at 26 feet.	6				

REMARKS

1 - Ground surface elevation estimated from a drawing entitled "TOPOGRAPHIC PLAN - MUNICIPAL PARKING LOT - MEMORIAL DRIVE PLYMOUTH, MA" prepared by Nitsch Engineering on 10/24/2011.
2 - Where applicable, field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Thermo Environmental 580B organic vapor meter equipped with a Photoionization detector (PID) and 10.6 eV lamp. Results in parts per million by volume (ppmv). ND indicates nothing detected (<0.1 ppm).
3 - In the "Blows per 6" column, the numbers which have an asterisk symbol indicates that after the preceding split spoon sample was driven an AW-rod attachment was placed on a split spoon and subsequently driven without cleaning out the borehole with the drill bit. These blow counts are not representative of SPT-N Values.
4 - Observed that the split spoon sample S-1 appeared to be dry and that the split spoon sample S-2 appeared to be saturated.
5 - Split spoon sample S-5 obtained no recovery, the driller subsequently placed a 3-inch split spoon on the bottom of the borehole and drove 2-feet and obtained 6-inches of recovery.
6 - Upon completion of the test boring, the contractor backfilled with drill cuttings and patched the surface with asphalt.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-11

GZA TEMPLATE TEST BORING 300; 12/4/2013; 10:57:14 AM

Appendix C

Laboratory Test Results

LABORATORY TESTING DATA SHEET

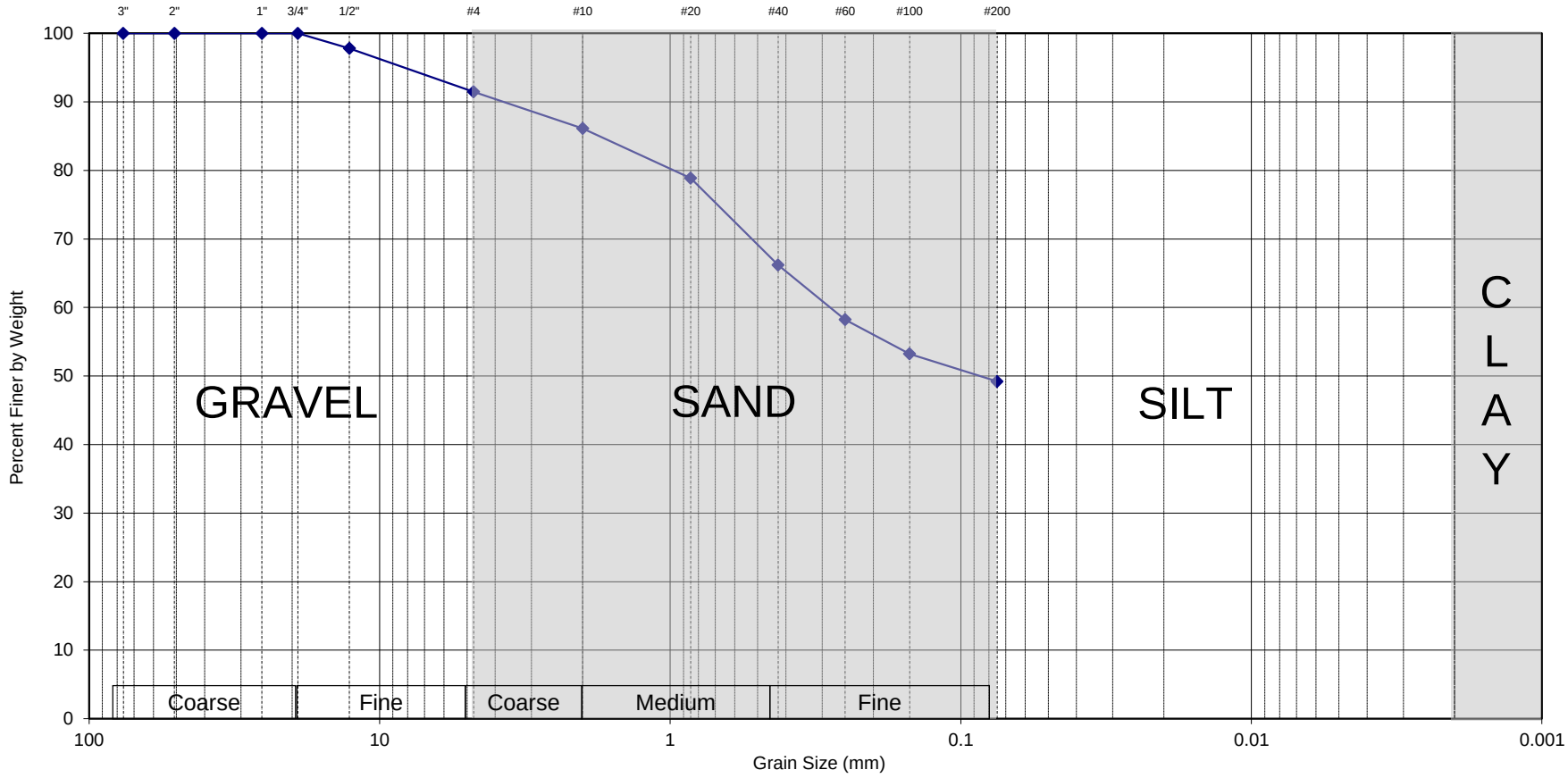
Project Name: Plymouth Parking Garage | Location: Plymouth, MA | Reviewed By:
Project No.: 01.0171716.00 | Assigned By: Jackson Hewlett
Project Manager: Jon Andrews | Report Date: 8/20/2013 | Date Reviewed: 8/20/2013

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests								Strength Tests					
				Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Torvane or Type Test	σ_c psf	Failure Criteria	$\sigma_1 - \sigma_3$ psf	Strain %	Laboratory Log and Soil Description
GZ-1	S-2	2.5-4.5	1				49.2										Brown SILT and f-c SAND, trace Gravel
GZ-1	S-3	4.5-6.5	2	18.8	23	17											Brown SILT & CLAY, trace Sand
GZ-2	S-1	1-3	3				7.5										Brown f-m SAND, little fine Gravel, trace Silt
GZ-4	S-9	34-36	4				42.6										Brown f-m SAND and SILT
GZ-6	S-1	1-3	5				38.2										Brown f-m SAND and SILT, little f c Gravel
GZ-6	S-7	24-26	6				7.2										Brown f-m SAND, some f-c Gravel, trace Silt
GZ-7	S-5	9-10.5	7	18.8	24	18											Gray-brown SILT & CLAY, trace Sand
GZ-11	S-5	24-26	8	34.9	40	25											Gray CLAY & SILT

THIELSCH ENGINEERING
195 Frances Avenue
Cranston, RI 02910
401-467-6454

ASTM D422

U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
8.6%	42.2%	49.2%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
1	GZ-1	S-2	2.5-4.5'	Brown SILT and f-c SAND, trace Gravel				

Sieve Size	% Passing
¾"	100.0
½"	97.8
#4	91.4
#10	86.1
#20	78.9
#40	66.2
#60	58.2
#100	53.2
#200	49.2

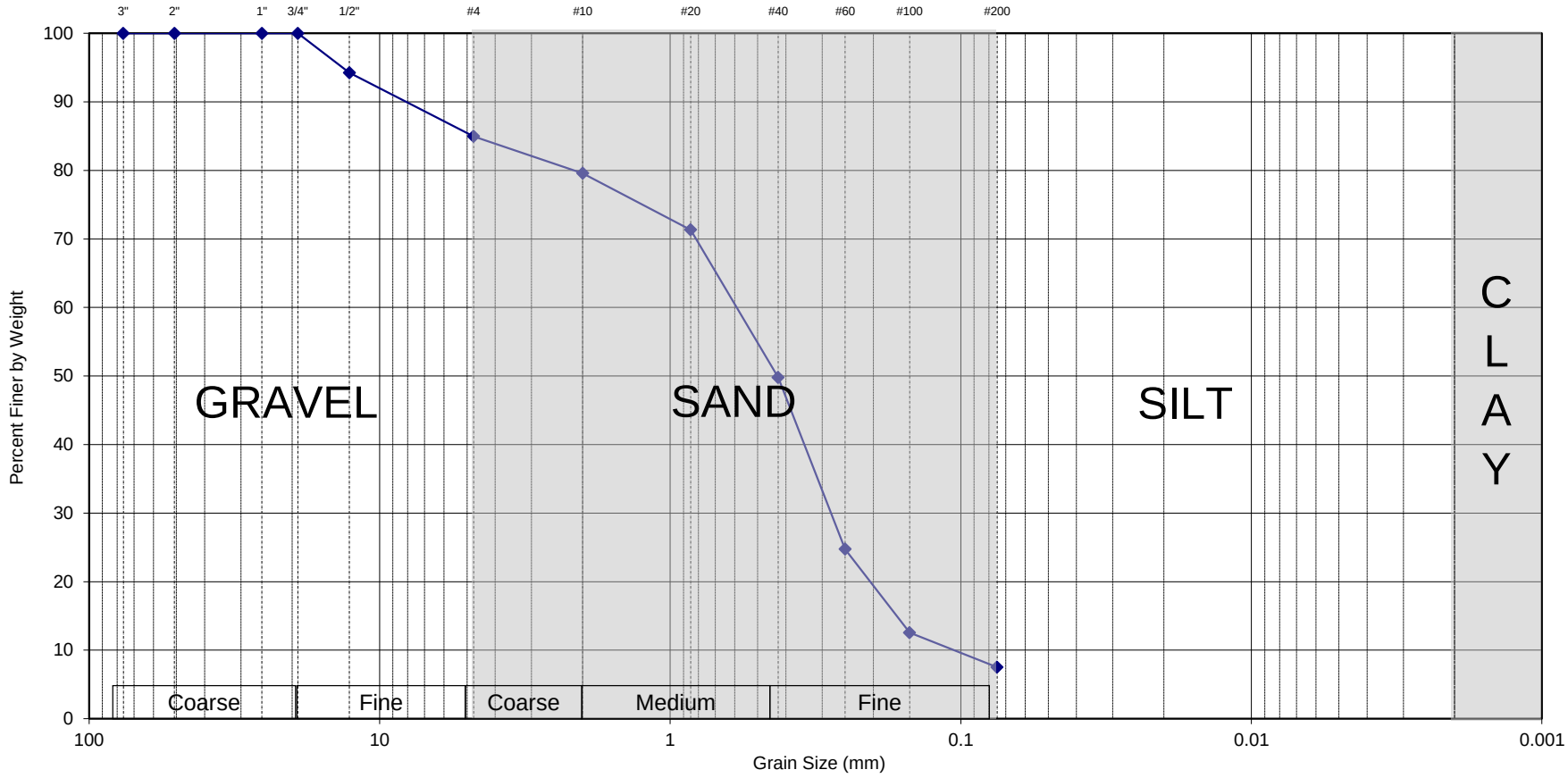
THIELSCH ENGINEERING
195 Frances Ave., Cranston, RI 02910
401-467-6454

CTS-74-13-0003
Plymouth Parking Garage
Plymouth, MA
GZA File # 01.0171716.00

Tested by: GG/LM Date: 8/16/13
Reviewed by: MBP Date: 8/19/13

ASTM D422

U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
15.0%	77.5%	7.5%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
3	GZ-2	S-1	1-3'	Brown f-m SAND, little fine Gravel, trace Silt				

Sieve Size	% Passing
¾"	100.0
½"	94.2
#4	85.0
#10	79.6
#20	71.3
#40	49.8
#60	24.7
#100	12.5
#200	7.5

THIELSCH ENGINEERING
195 Frances Ave., Cranston, RI 02910
401-467-6454

CTS-74-13-0003
Plymouth Parking Garage
Plymouth, MA
GZA File # 01.0171716.00

Tested by: GG/LM Date: 8/16/13
Reviewed by: MBP Date: 8/19/13

ASTM D422

U.S. STANDARD SIEVE AND HYDROMETER

Gravel	Sand	Fines
0.5%	56.9%	42.6%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
4	GZ-4	S-9	34-36'	Brown f-m SAND and SILT				

Sieve Size	% Passing
¾"	100.0
½"	100.0
#4	99.5
#10	99.2
#20	97.3
#40	84.9
#60	66.7
#100	54.7
#200	42.6

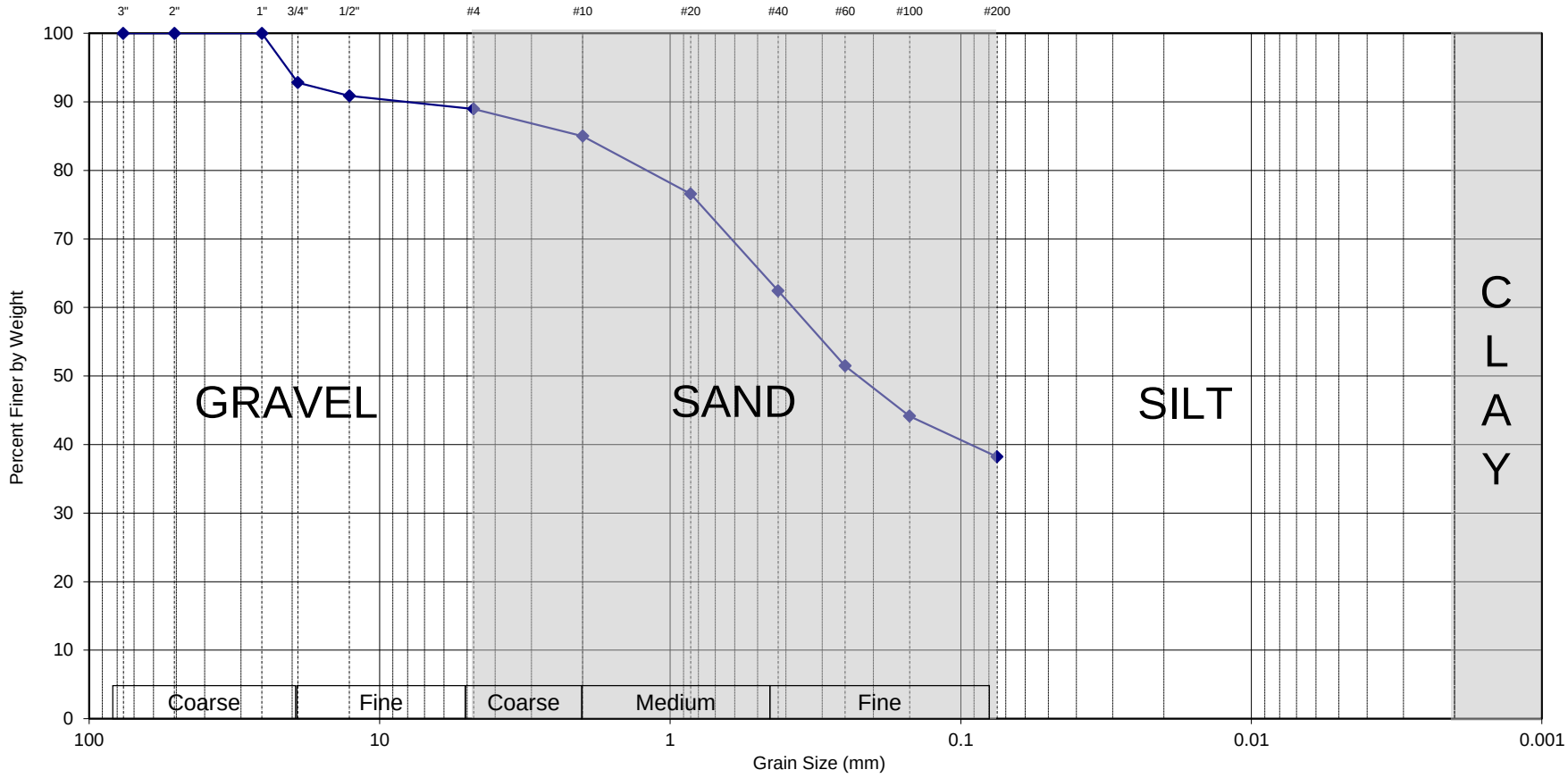
THIELSCH ENGINEERING
195 Frances Ave., Cranston, RI 02910
401-467-6454

CTS-74-13-0003
Plymouth Parking Garage
Plymouth, MA
GZA File # 01.0171716.00

Tested by: GG/LM Date: 8/16/13
Reviewed by: MBP Date: 8/19/13

ASTM D422

U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
11.0%	50.7%	38.2%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
5	GZ-6	S-1	1-3'	Brown f-m SAND and SILT, little f-c Gravel				

Sieve Size	% Passing
¾"	92.8
½"	90.9
#4	89.0
#10	85.0
#20	76.6
#40	62.4
#60	51.5
#100	44.1
#200	38.2

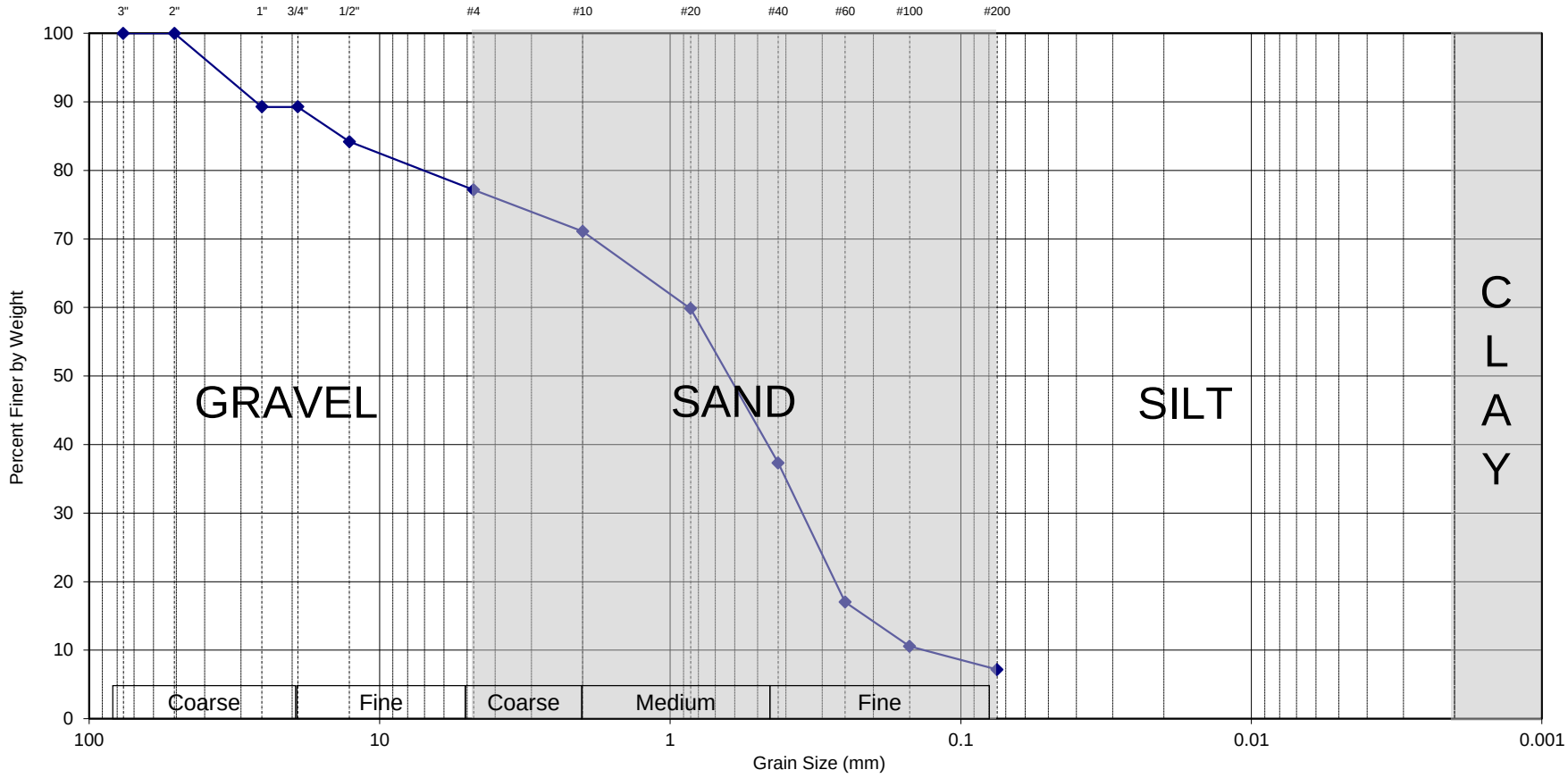
THIELSCH ENGINEERING
195 Frances Ave., Cranston, RI 02910
401-467-6454

CTS-74-13-0003
Plymouth Parking Garage
Plymouth, MA
GZA File # 01.0171716.00

Tested by: GG/LM Date: 8/16/13
Reviewed by: MBP Date: 8/19/13

ASTM D422

U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
22.8%	70.0%	7.2%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
6	GZ-6	S-7	24-26'	Brown f-m SAND, some f-c Gravel, trace Silt				

Sieve Size	% Passing
¾"	89.3
½"	84.2
#4	77.2
#10	71.1
#20	59.8
#40	37.3
#60	17.0
#100	10.5
#200	7.2

THIELSCH ENGINEERING
195 Frances Ave., Cranston, RI 02910
401-467-6454

CTS-74-13-0003
Plymouth Parking Garage
Plymouth, MA
GZA File # 01.0171716.00

Tested by: GG/LM Date: 8/16/13
Reviewed by: MBP Date: 8/19/13